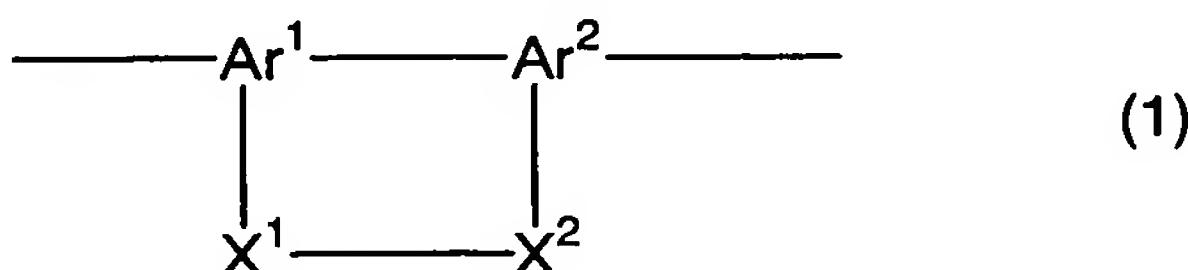
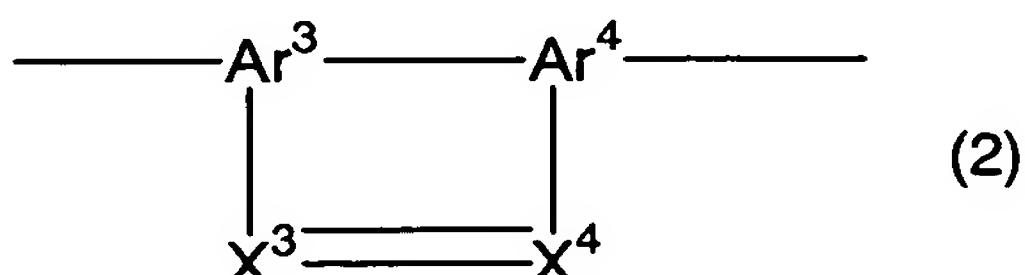


Claims

1. A polymer compound comprising a repeating unit of below formula (1) or (2), and having a polystyrene reduced number average molecular weight of 10^3 to 10^8 .



[wherein, Ar¹ and Ar² each independently represent a trivalent aromatic hydrocarbon group or a trivalent heterocyclic group. X¹ and X² each independently represent O, S, C(=O), S(=O), SO₂, C(R¹)(R²), Si(R³)(R⁴), N(R⁵), B(R⁶), P(R⁷) or P(=O)(R⁸). Here, R¹, R², R³, R⁴, R⁵, R⁶, R⁷ and R⁸ each independently represent a hydrogen atom, halogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, arylalkylthio group, acyl group, acyloxy group, amide group, acid imide group, imine residue, amino group, substituted amino group, substituted silyl group, substituted silyloxy group, substituted silylthio group, substituted silylamino group, a monovalent heterocyclic group, arylalkenyl group, arylethynyl group, carboxyl group or cyano group. R¹ and R², or R³ and R⁴ may be connected mutually to form a ring. X¹ and X² are not the same. Moreover, X¹ and Ar² bond to adjacent carbons in the aromatic ring of Ar¹, and X² and Ar¹ bond to adjacent carbons in the aromatic ring of Ar²],

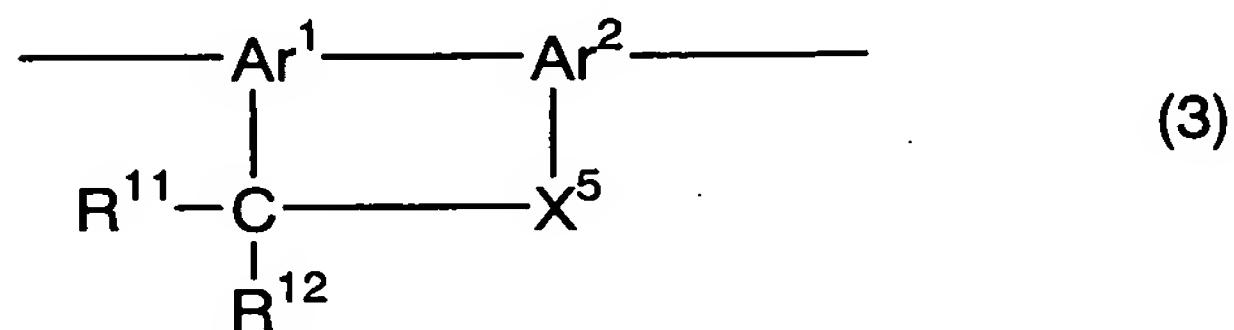


wherein, Ar³ and Ar⁴ each independently represent a trivalent aromatic hydrocarbon group or a trivalent heterocyclic group. X³ and X⁴ each independently represent N, B, P, C(R⁹) or Si(R¹⁰). Here, R⁹ and R¹⁰ each independently represent a hydrogen atom, halogen atom, alkyl group, alkyloxy group, alkylthio group,

aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, arylalkylthio group, acyl group, acyloxy group, amide group, acid imide group, imine residue, amino group, substituted amino group, substituted silyl group, substituted silyloxy group, substituted silylthio group, substituted silylamino group, a monovalent heterocyclic group, arylalkenyl group, arylethynyl group, carboxyl group or cyano group. X^3 and X^4 are not the same. Moreover, X^3 and Ar^4 bond to adjacent carbons in the aromatic ring of Ar^3 , and X^4 and Ar^3 bond to adjacent carbons in the aromatic ring of Ar^4 .].

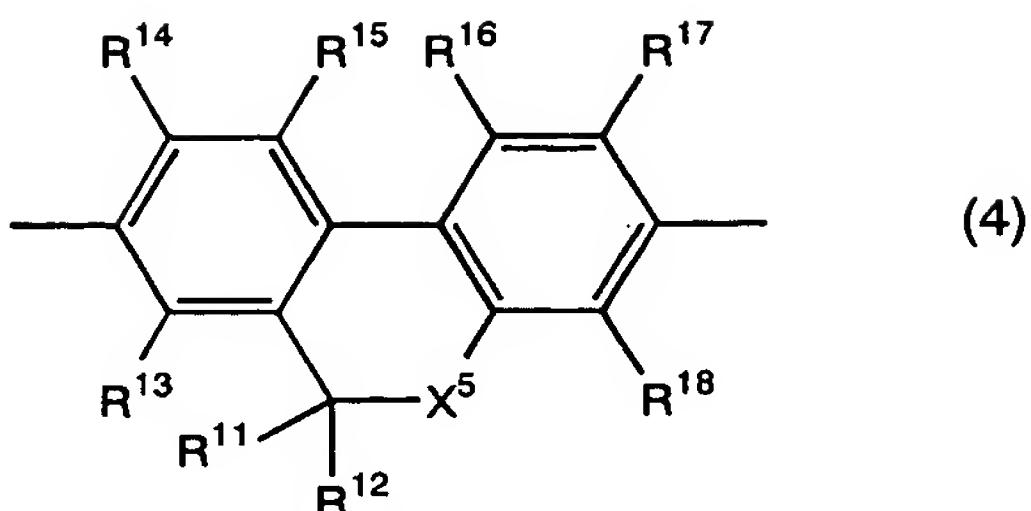
2. A polymer compound according to Claim 1, wherein X^1 of formula (1) is $C(R^1)(R^2)$, $Si(R^3)(R^4)$, $N(R^5), B(R^6)$, $P(R^7)$ or $P(=O)(R^8)$ (in the formula, R^1-R^8 represent the same meaning as the above.)

3. A polymer compound according to claims 1 or 2, wherein the repeating unit represented by the above formula (1) is a repeating unit represented by the below formula (3),



[in the formula, Ar^1 and Ar^2 represent the same meaning as the above. R^{11} and R^{12} each independently represent a hydrogen atom, halogen atom, alkyl group, aryl group, arylalkyl group, or monovalent heterocyclic group, and may be mutually connected to form a ring. X^5 represents O , S , $C(=O)$, $S(=O)$, SO_2 , $Si(R^3)(R^4)$, $N(R^5), B(R^6)$, $P(R^7)$ or $P(=O)(R^8)$. (R^3 , R^4 , R^5 , R^6 , R^7 and R^8 represent the same meaning as the above.)]

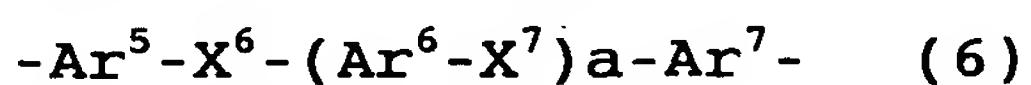
4. A polymer compound according to Claim 3, wherein the repeating unit represented by the above formula (3) is a repeating unit represented by the below formula (4),



[in the formula, X^5 , R^{11} and R^{12} represent the meaning as the above. R^{13} , R^{14} , R^{15} , R^{16} , R^{17} , and R^{18} each independently represent a hydrogen atom, halogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, arylalkylthio group, acyl group, acyloxy group, amide group, acid imide group, Imine residue, amino group, substituted amino group, substituted silyl group, substituted silyloxy group, substituted silylthio group, substituted silylamino group, a monovalent heterocyclic group, arylalkenyl group, aryl ethynyl group, carboxyl group, or cyano group. R^{14} , R^{15} , and R^{16} and R^{17} may be connected mutually to form a ring.].

5. A polymer compound according to Claim 4, wherein X^5 in the above formula (4) is an oxygen atom.

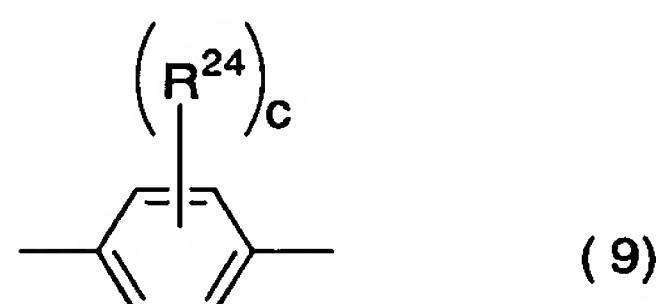
6. A polymer compound according to claim 1, wherein the repeating unit represented by the above formula (1) or (2), is included, and further the repeating unit represented by the below formula (5), formula (6), formula (7), or formula (8) included,



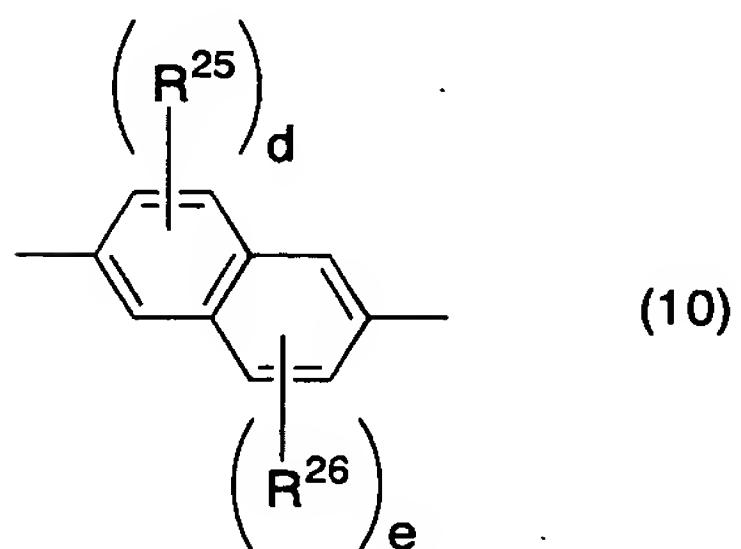
[In the formula, Ar^5 , Ar^6 , and Ar^7 each independently represent an arylene group, divalent heterocyclic group, or divalent group having metal complex structure. X^6 represents $-\text{C}\equiv\text{C}-$, $-\text{N}(\text{R}^{21})-$ or $-(\text{SiR}^{22}\text{R}^{23})_y-$. X^7 represents $-\text{CR}^{19}=\text{CR}^{20}-$, $-\text{C}\equiv\text{C}-$, $-\text{N}(\text{R}^{21})-$ or $-(\text{SiR}^{22}\text{R}^{23})_y-$. R^{19} and R^{20} each independently

represent a hydrogen atom, alkyl group, aryl group, monovalent heterocyclic group, carboxyl group or cyano group. R²¹, R²² and R²³ each independently represent a hydrogen atom, alkyl group, aryl group, monovalent heterocyclic group or arylalkyl group. a represents an integer of 0-1. b represents an integer of 1-12.].

7. A polymer compound according to claim 6, wherein formula (5) is a repeating unit represented by the below formula (9), (10), (11), (12), (13), or (14),

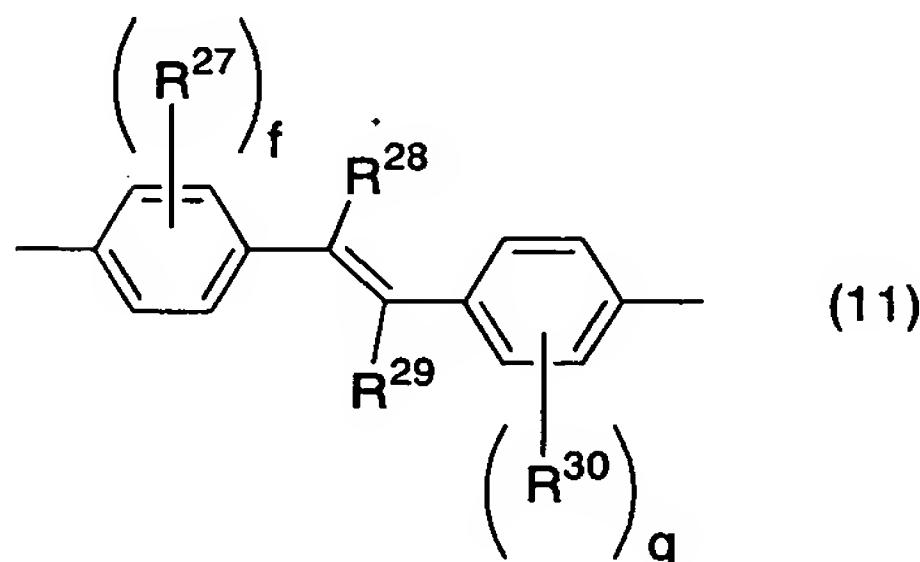


[in the formula, R²⁴ represents a halogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, arylalkylthio group, acyl group, acyloxy group, amide group, acid imide group, imino group, amino group, substituted amino group, substituted silyl group, substituted silyloxy group, substituted silylthio group, substituted silylamino group, monovalent heterocyclic group, arylalkenyl group, aryl ethynyl group, carboxyl group, or cyano group. c represents an integer of 0-4.].

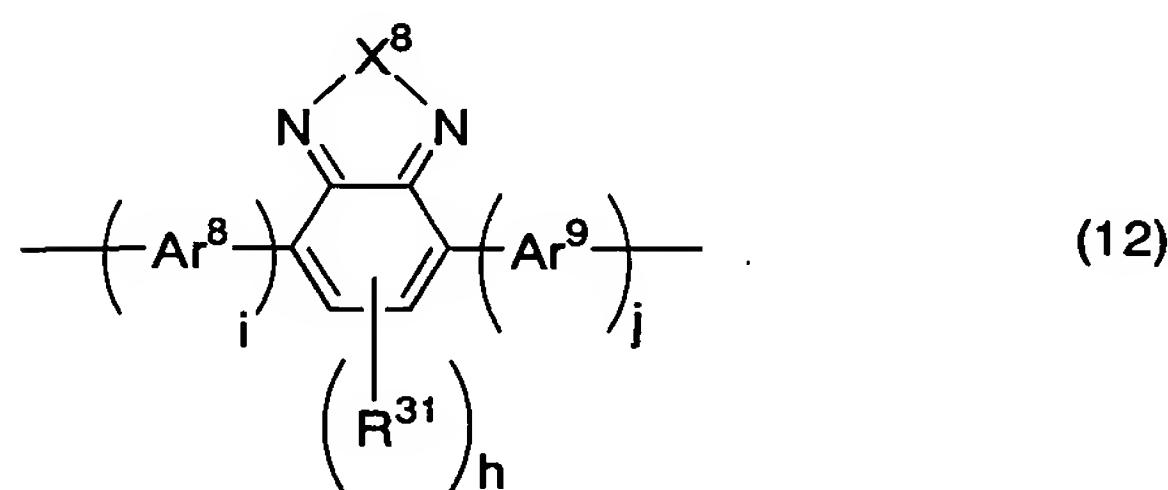


[in the formula, R²⁵ and R²⁶ each independently represent a halogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, arylalkylthio group, acyl group, acyloxy group, amide group, acid imide group, imino group, amino group,

substituted amino group, substituted silyl group, substituted silyloxy group, substituted silylthio group, substituted silylamino group, monovalent heterocyclic group, arylalkenyl group, arylethynyl group, carboxyl group, or cyano group. d and e each independently represent an integer of 0-3.],

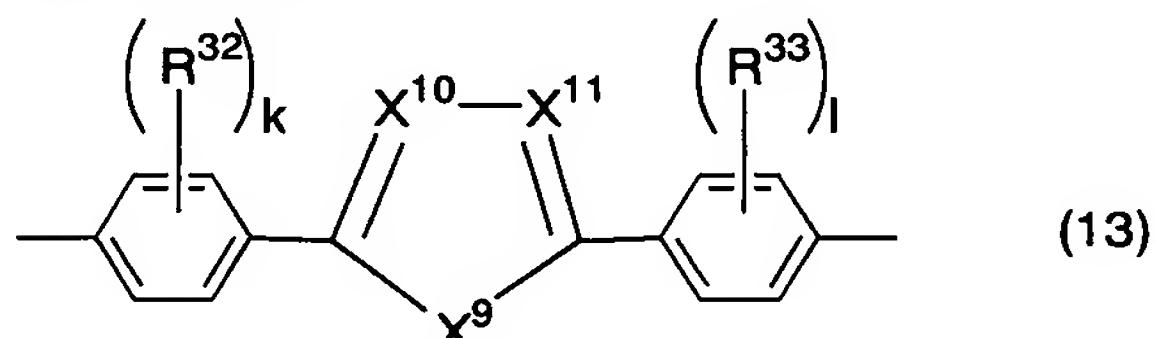


[In the formula, R²⁷ and R³⁰ each independently represent a halogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, arylalkylthio group, acyl group, acyloxy group, amide group, acid imide group, imino group, amino group, substituted amino group, substituted silyl group, substituted silyloxy group, substituted silylthio group, substituted silylamino group, monovalent heterocyclic group, arylalkenyl group, arylethynyl group, carboxyl group, or cyano group. R²⁸ and R²⁹ each independently represent a hydrogen atom, alkyl group, aryl group, monovalent heterocyclic group, carboxyl group, or cyano group.],

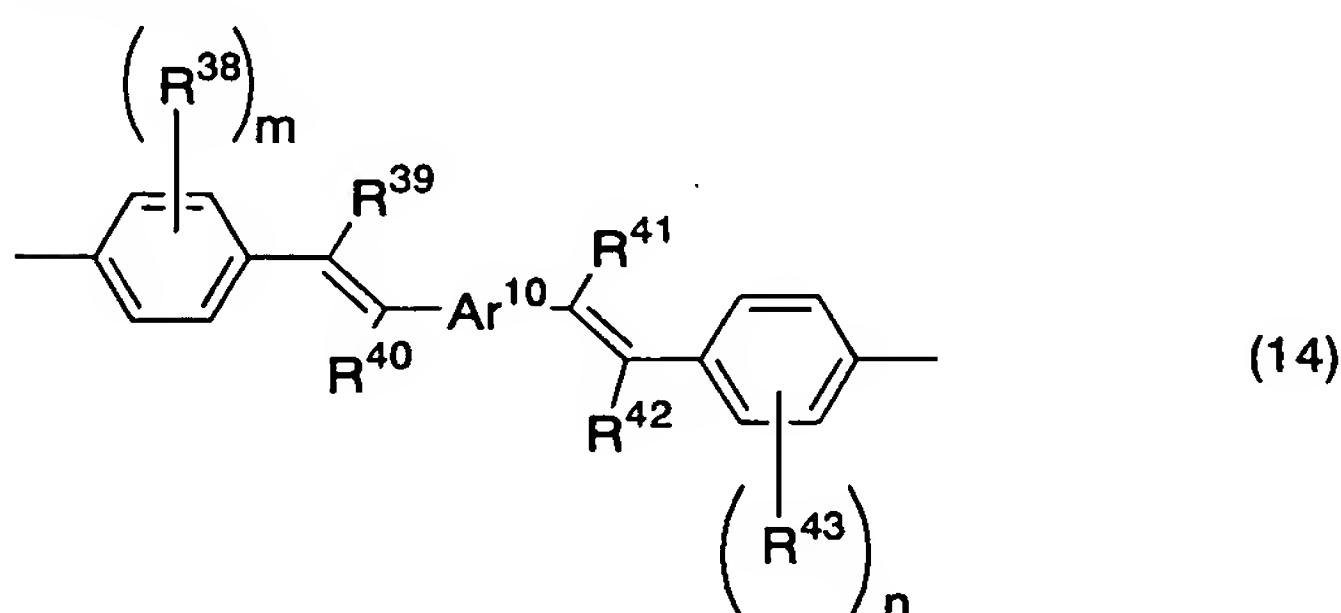


[In the formula, R³¹ represent a halogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, aryl alkylthio group, acyl group, acyloxy group, amide group, acid imide group, imino group, amino group, substituted amino group, substituted silyl group, substituted silyloxy group,

substituted silylthio group, substituted silylamino group, monovalent heterocyclic group, arylalkenyl group, aryl ethynyl group, carboxyl group, or cyano group. h represents an integer of 0-2. Ar⁸ and Ar⁹ each independently represent an arylene group, divalent heterocyclic group, or a divalent group having metal complex structure. i and j each independently represent 0 or 1. X⁸ represents O, S, SO, SO₂, Se or Te.].



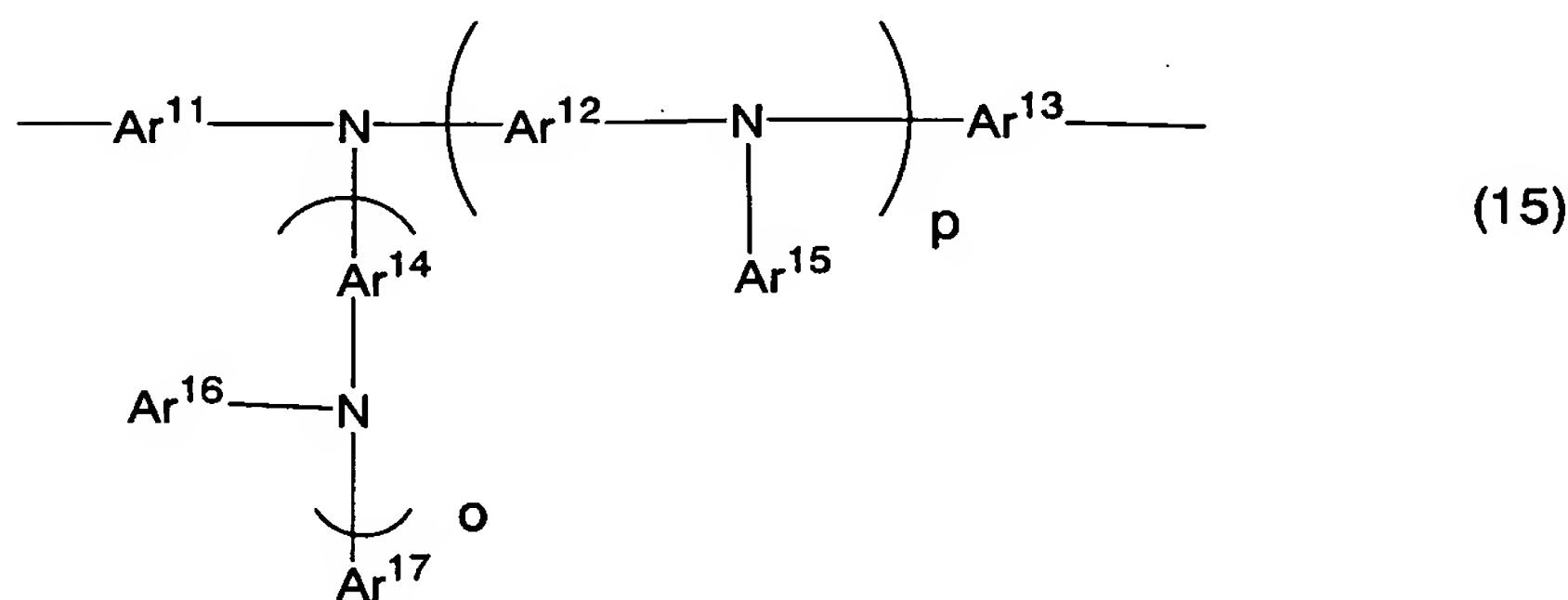
[in the formula, R³² and R³³ each independently represent a halogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, arylalkylthio group, acyl group, acyloxy group, amide group, acid imide group, imino group, amino group, substituted amino group, substituted silyl group, substituted silyloxy group, substituted silylthio group, substituted silylamino group, monovalent heterocyclic group, arylalkenyl group, arylethynyl group, carboxyl group, or cyano group. k and l each independently represent an integer of 0-4. X⁹ represents O, S, SO, SO₂, Se, Te, N-R³⁴, or SiR³⁵R³⁶. X¹⁰ and X¹¹ each independently represent N or C-R³⁷. R³⁴, R³⁵, R³⁶ and R³⁷ each independently represent a hydrogen atom, alkyl group, aryl group, arylalkyl group or a monovalent heterocyclic group.].



[in the formula, R³⁸ and R⁴³ each independently represent a halogen atom, alkyl group, alkyloxy group, alkylthio group,

aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, arylalkylthio group, acyl group, acyloxy group, amide group, acid imide group, imino group, amino group, substituted amino group, substituted silyl group, substituted silyloxy group, substituted silylthio group, substituted silylamino group, monovalent heterocyclic group, arylalkenyl group, arylethynyl group, carboxyl group, or cyano group. m and n each independently represent an integer of 0-4. R³⁹, R⁴⁰, R⁴¹, and R⁴² each independently represent a hydrogen atom, alkyl group, aryl group, monovalent heterocyclic group, carboxyl group, or cyano group. Ar¹⁰ represents an arylene group, divalent heterocyclic group, or a divalent group having metal complex structure.].

8. A polymer compound according to Claim 1, wherein the repeating unit represented by the above formula (1) or (2) is included, and further the repeating unit represented by the below formula (15) is included,



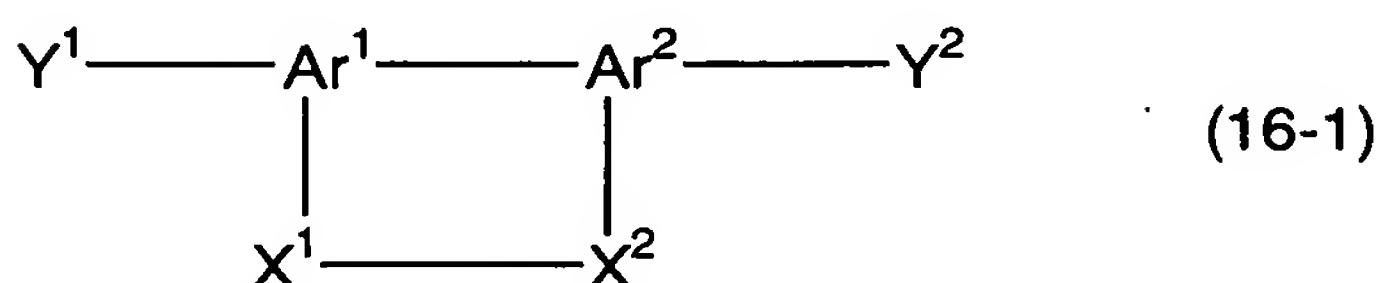
[in the formula, Ar¹¹, Ar¹², Ar¹³, and Ar¹⁴ each independently represent an arylene group or a divalent heterocyclic group Ar¹⁵, Ar¹⁶, and Ar¹⁷ each independently represent an aryl group or a monovalent heterocyclic group. o and p each independently represent 0 or 1, and $0 \leq o+p \leq 1$].

9. A polymer compound according to any one of claims 1 to 8, wherein the total of the repeating unit represented by formula (1) and (2) is 10 % by mole or more based on whole repeating units.

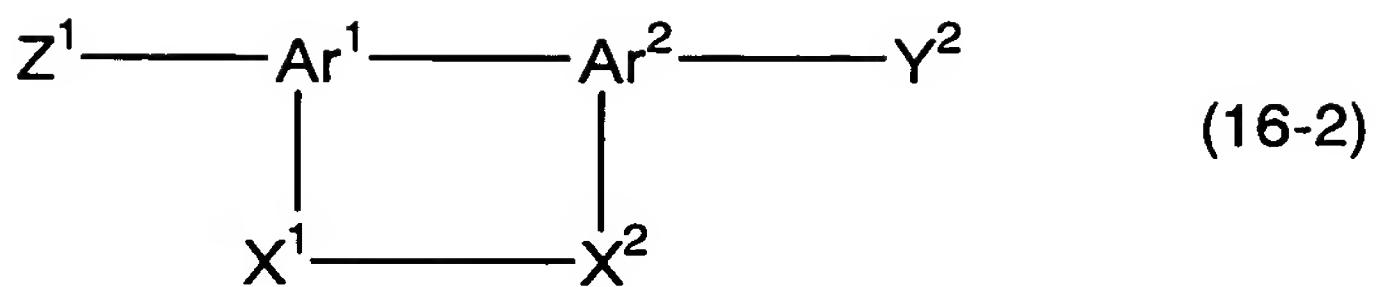
10. A polymer compound according to any one of claims 1 to 9, having liquid-crystal property.

11. A polymer compound according to any one of claims 1 to 10, having fluorescence in the solid state.

12. A compound represented by the below formula (16-1) or (16-2),

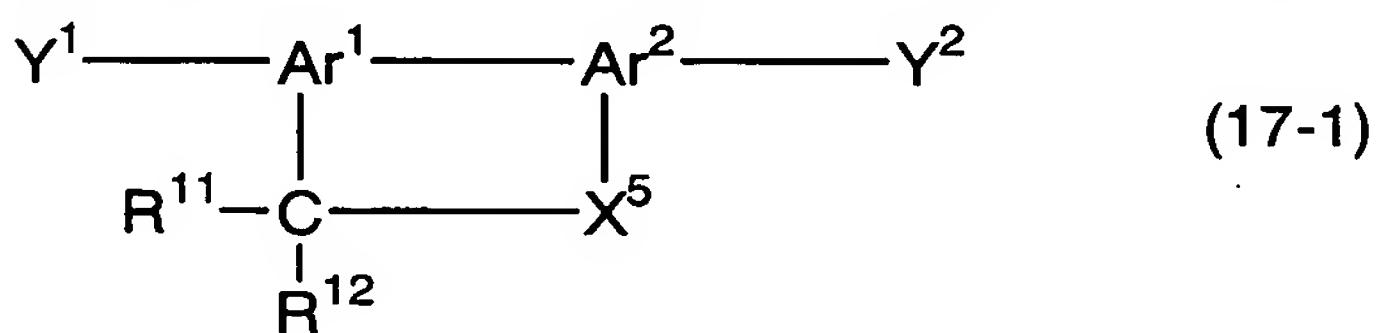


(in the formula, Ar^1 and Ar^2 each independently represent a trivalent aromatic hydrocarbon group or a trivalent heterocyclic group. X^1 and X^2 each independently represent O, S, C(=O), S(=O), SO₂, C(R¹)(R²), Si(R³)(R⁴), N(R⁵), B(R⁶), P(R⁷) or P(=O)(R⁸). Here, R¹, R², R³, R⁴, R⁵, R⁶, R⁷, and R⁸ each independently represent a hydrogen atom, halogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, aryl alkylthio group, acyl group, acyloxy group, amide group, acid imide group, imine residue, amino group, substituted amino group, substituted silyl group, substituted silyloxy group, substituted silylthio group, substituted silylamino group, monovalent heterocyclic group, arylalkenyl group, aryl ethynyl group, carboxyl group, or cyano group. R¹ and R², or R³ and R⁴ may be connected mutually to form a ring. X¹ and X² are not the same. X¹ and Ar¹ bond to adjacent carbons in the aromatic ring of Ar¹, and X² and Ar¹ bond to adjacent carbons in the aromatic ring of Ar². Y¹ and Y² each independently represent a halogen atom, alkylsulfonate group, arylsulfonate group, arylalkylsulfonate group, boric ester group, sulfonium methyl group, phosphonium methyl group, phosphonate methyl group, monohalogenated methyl group, boric acid group, formyl group, or vinyl group.

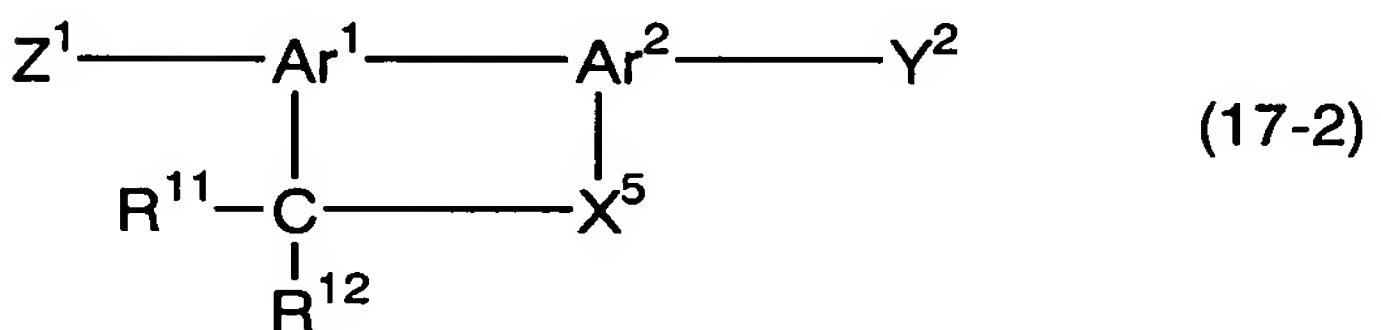


(In the formula, Ar^1 , Ar^2 , X^1 , X^2 , and Y^2 are the same as those of the above. Z^1 represents a hydrogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, arylalkylthio group, substituted amino group, substituted silyl group, monovalent heterocyclic group, arylalkenyl group, or aryl ethynyl group.).

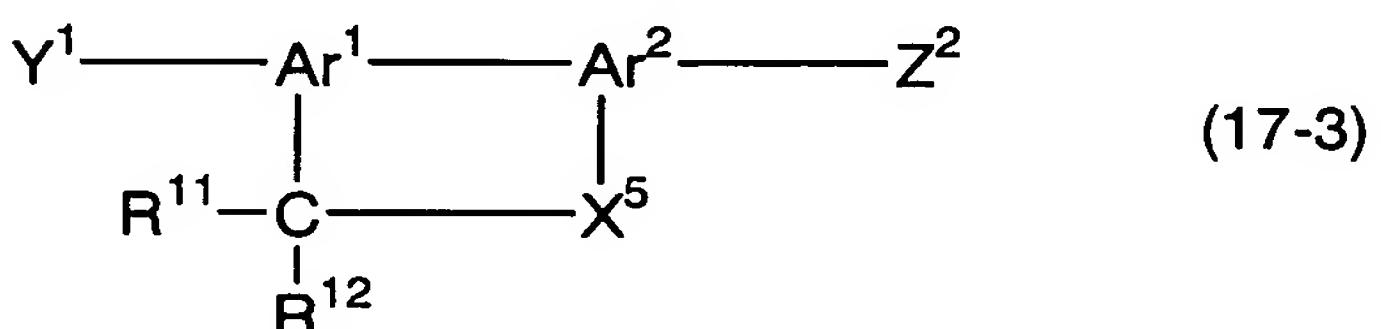
13. A compound according to Claim 12, represented by the below formula (17-1), (17-2), or (17-3),



(in the formula, Ar^1 , Ar^2 , R^{11} , R^{12} , X^5 , Y^1 , and Y^2 represent the same meaning as the above.)



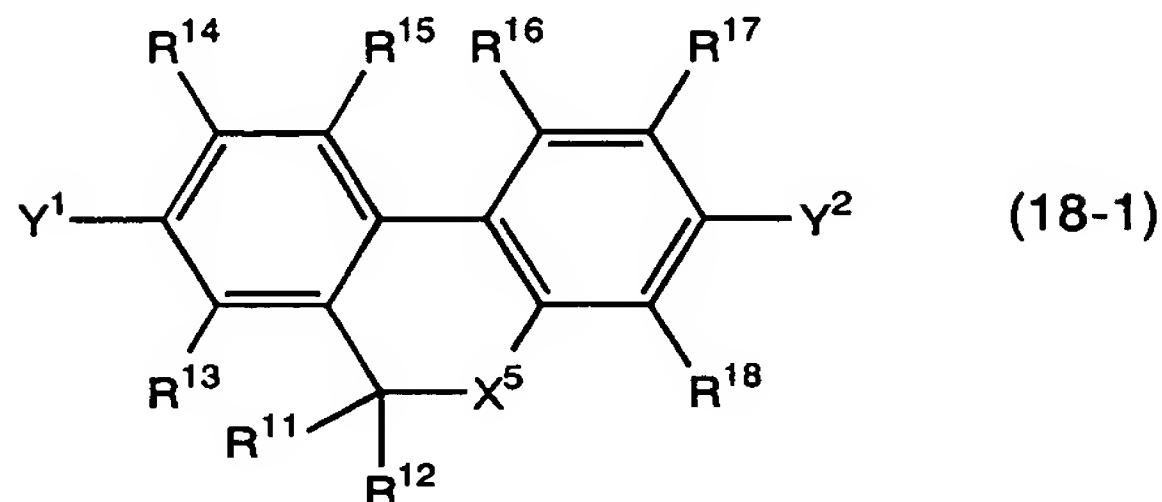
(in the formula, Ar^1 , Ar^2 , R^{11} , R^{12} , X^5 , Y^2 , and Z^1 represent the same meaning as the above.)



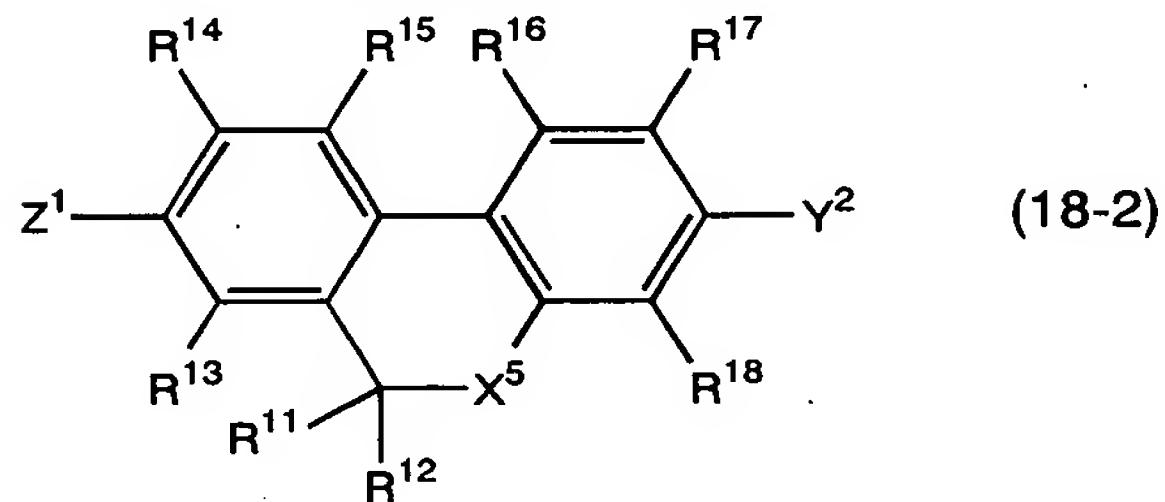
(in the formula, Ar^1 , Ar^2 , R^{11} , R^{12} , X^5 , and Y^1 represent the same meaning as the above. Z^2 represents a hydrogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, arylalkylthio group, substituted amino group, substituted silyl group, monovalent heterocyclic group, arylalkenyl group,

or aryl ethynyl group.).

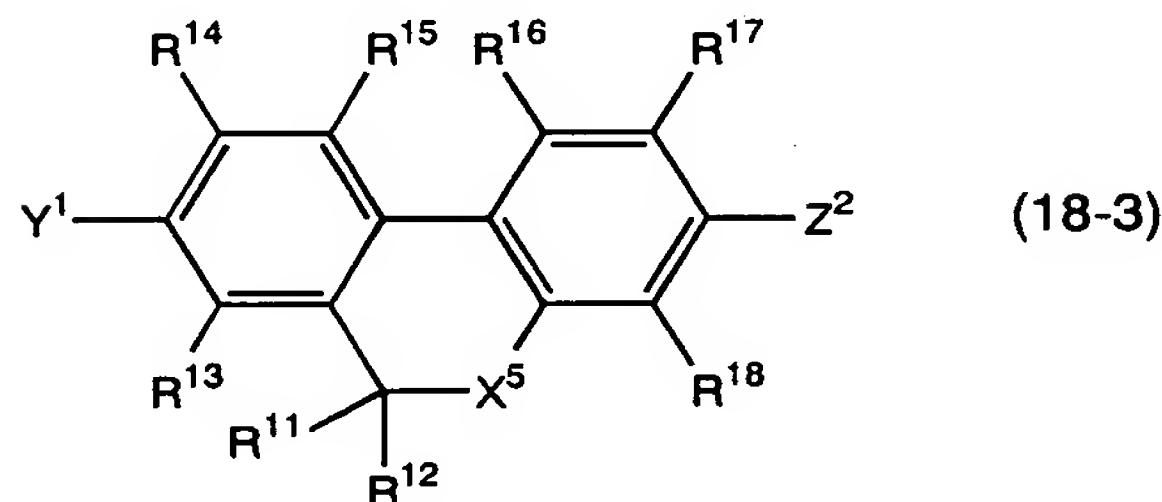
14. A compound according to Claim 13, represented by the below formula (18-1), (18-2), or (18-3).



(in the formula, R^{11} , R^{12} , R^{13} , R^{14} , R^{15} , R^{16} , R^{17} , R^{18} , X^5 , Y^1 , and Y^2 represent the same meaning as the above.)



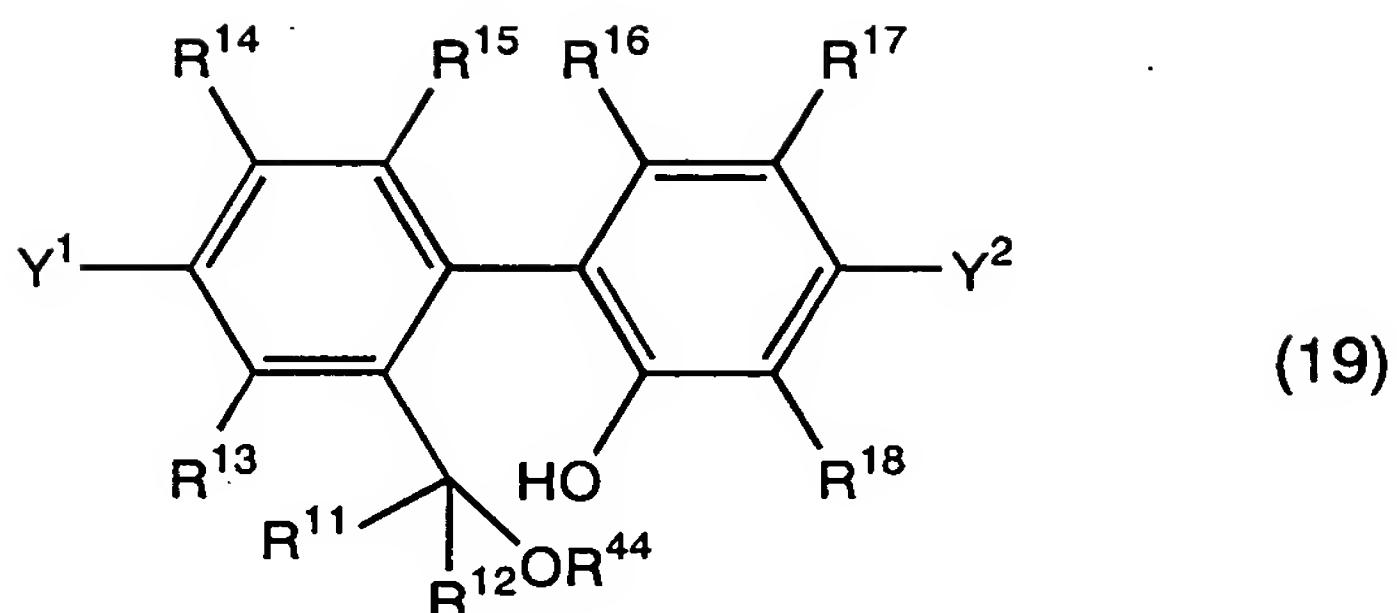
(in the formula, R^{11} , R^{12} , R^{13} , R^{14} , R^{15} , R^{16} , R^{17} , R^{18} , X^5 , Y^2 , and Z^1 represent the same meaning as the above.)



(in the formula, R^{11} , R^{12} , R^{13} , R^{14} , R^{15} , R^{16} , R^{17} , R^{18} , X^5 , Y^1 , and Z^2 represent the same meaning as the above.) .

15. A compound according to Claim 14, wherein X^5 is an oxygen atom in the above formula (18-1), (18-2), or (18-3).

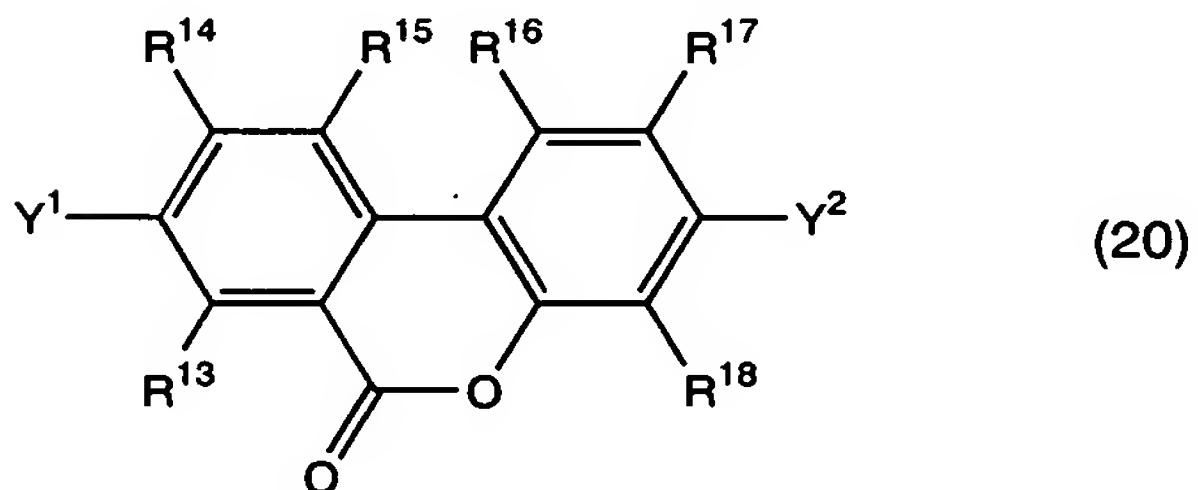
16. A compound represented by the below formula (19).



(in the formula, R¹¹, R¹², R¹³, R¹⁴, R¹⁵, R¹⁶, R¹⁷, R¹⁸, Y¹, and Y² represent the same meaning as the above. R⁴⁴ represents a hydrogen atom, alkyl group, aryl group, arylalkyl, or a monovalent heterocyclic group.).

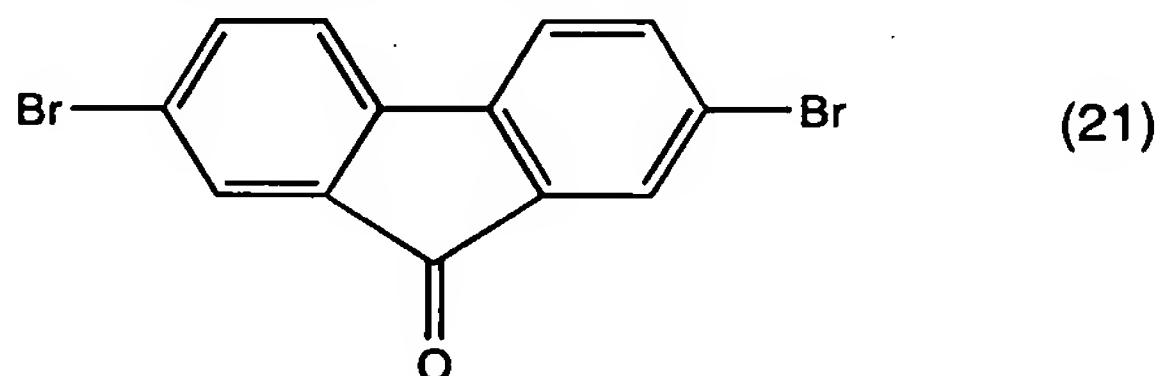
17. A manufacture method of the compound of Claim 15, wherein the compound represented by the above formula (19) is contacted with acid.

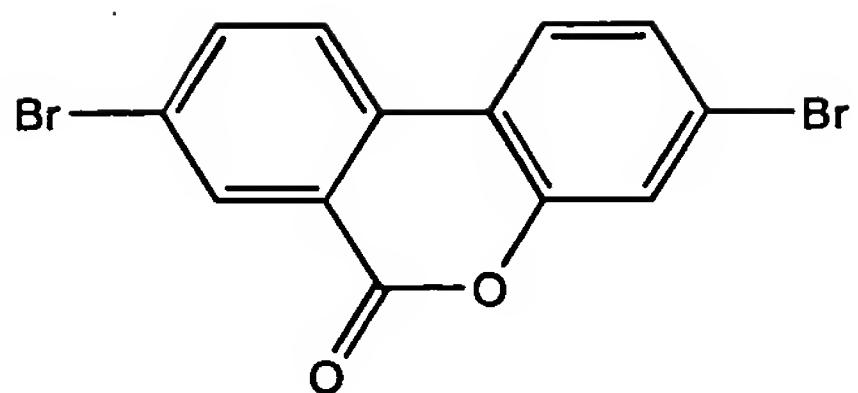
18. A manufacture method of a compound having a hydrogen atom as R⁴⁴ in the compounds represented by the above formula (19), wherein a compound represented by the below formula (20), is reacted with a Grignard reagent, or organo Li compound,



(in the formula, R¹³, R¹⁴, R¹⁵, R¹⁶, R¹⁷, R¹⁸, Y¹, and Y² represent the same meaning as the above.)

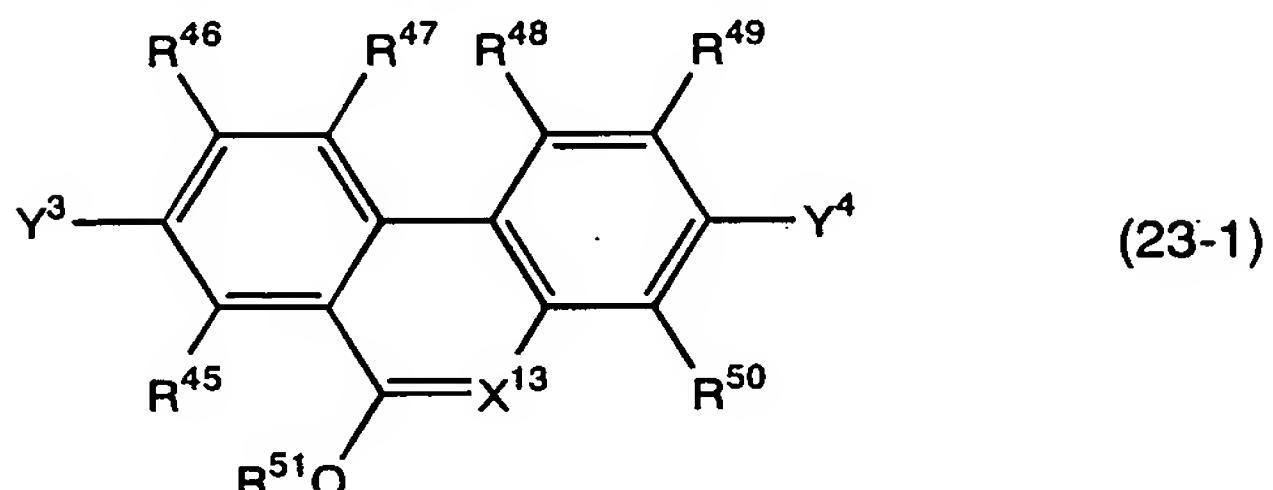
19. A manufacture method of the compound represented by the below formula (22), wherein the compound represented by the below formula (21) is reacted with sodium perborate,





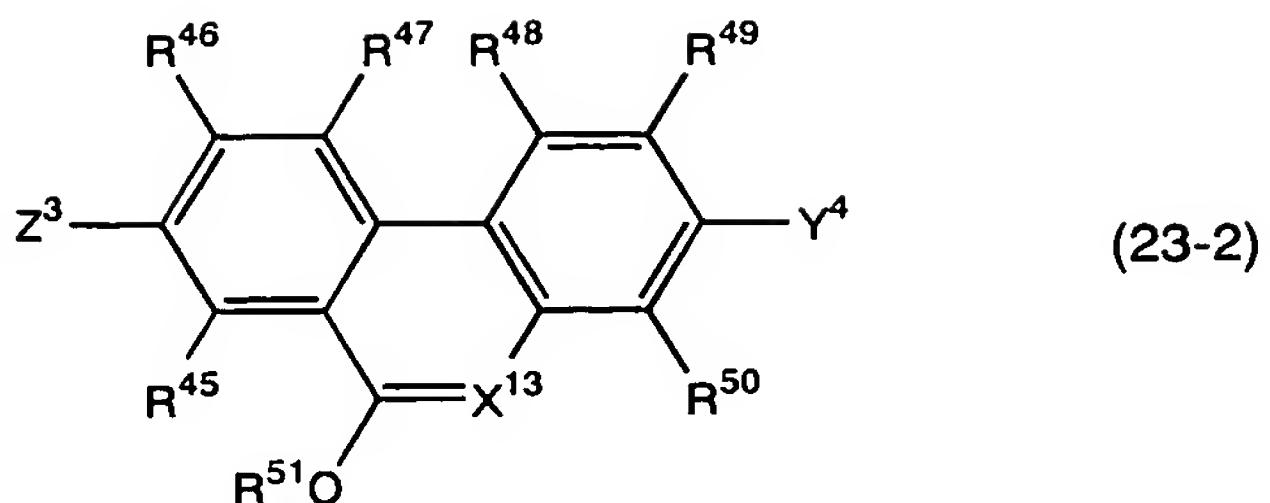
(22)

20. A compound represented by the below formula (23-1), (23-2), (23-3), (24-1), (24-2), or (24-3),

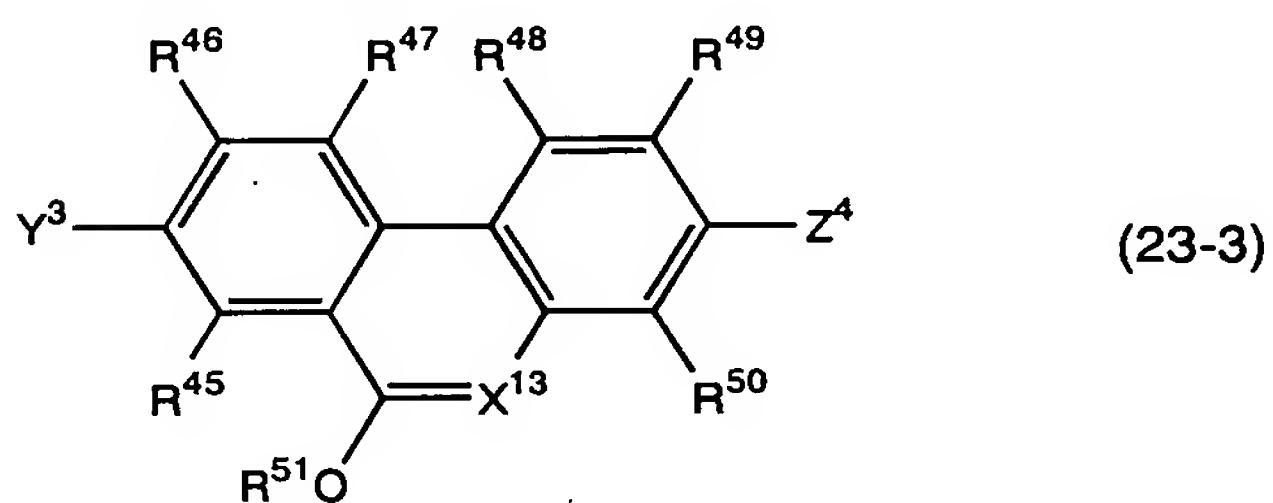


(23-1)

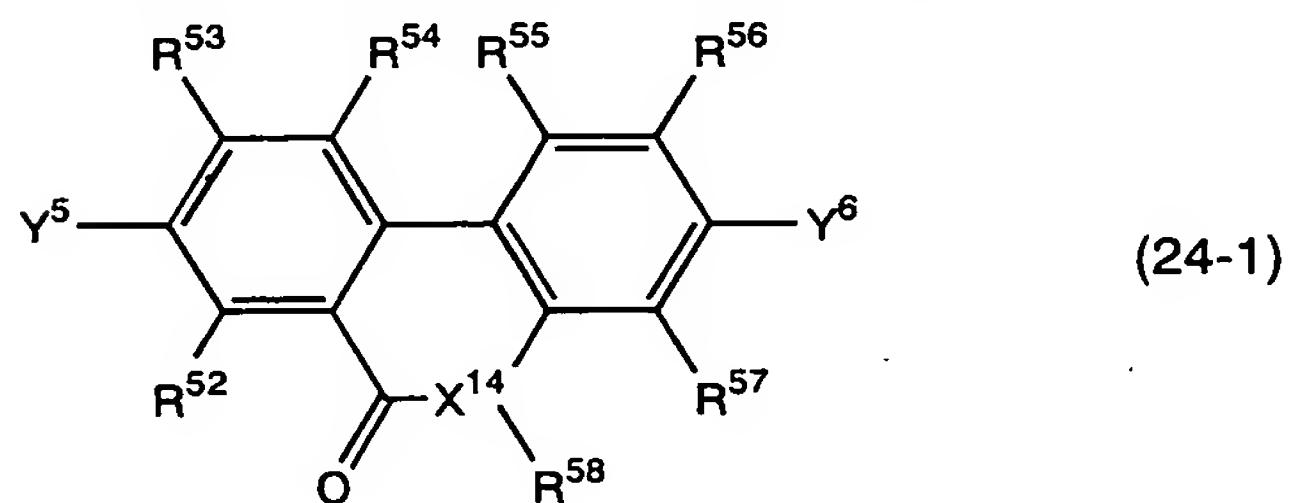
(in the formula, X^{13} represents a boron atom, a nitrogen atom, or a phosphorus atom. Y^3 and Y^4 each independently represent a halogen atom, alkylsulfonate group, arylsulfonate group, arylalkylsulfonate group, boric ester group, sulfonium methyl group, phosphonium methyl group, phosphonate methyl group, monohalogenated methyl group, boric acid group, formyl group, or vinyl group. R^{45} , R^{46} , R^{47} , R^{48} , R^{49} , and R^{50} , each independently represent a hydrogen atom, halogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, aryl alkylthio group, acyl group, acyloxy group, amide group, imide group, Imine residue, amino group, substituted amino group, substituted silyl group, substituted silyloxy group, substituted silylthio group, substituted silylamino group, a monovalent heterocyclic group, arylalkenyl group, aryl ethynyl group, carboxyl group, or cyano group. R^{46} , and R^{47} , or R^{48} and R^{49} may be connected mutually to form a ring. R^{51} represents an alkyl group, aryl group, arylalkyl group, or monovalent heterocyclic group.)



(in the formula, R⁴⁵, R⁴⁶, R⁴⁷, R⁴⁸, R⁴⁹, R⁵⁰, R⁵¹, X¹³, and Y⁴ represent the same meaning as the above. Z³ represents a hydrogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, aryl alkylthio group, substituted amino group, substituted silyl group, a monovalent heterocyclic group, arylalkenyl group, or aryl ethynyl group.)

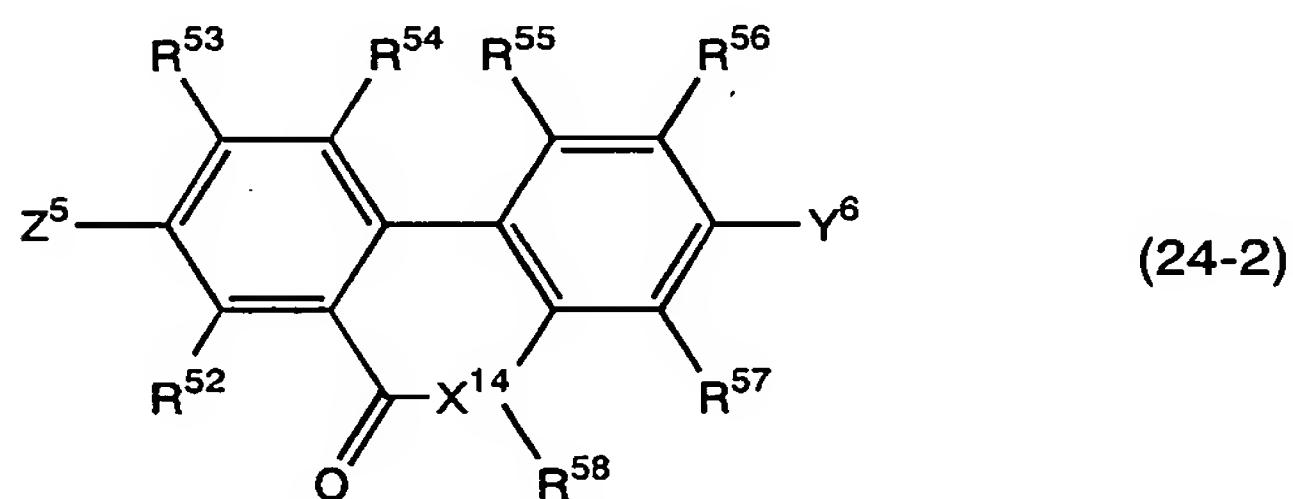


(in the formula, R⁴⁵, R⁴⁶, R⁴⁷, R⁴⁸, R⁴⁹, R⁵⁰, R⁵¹, X¹³, and Y³ represent the same meaning as the above. Z⁴ represents a hydrogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, arylalkylthio group, substituted amino group, substituted silyl group, a monovalent heterocyclic group, arylalkenyl group, or aryl ethynyl group.)

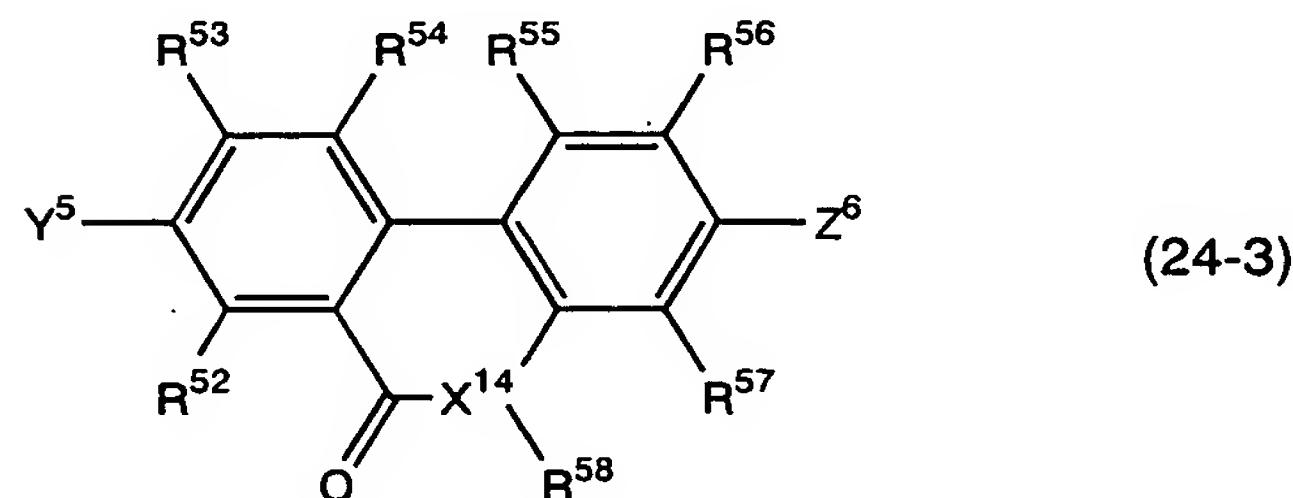


(in the formula, X¹⁴ represents a boron atom, nitrogen atom, or phosphorus atom. Y⁵ and Y⁶ each independently represent a halogen atom, alkylsulfonate group, arylsulfonate group, arylalkylsulfonate group, boric ester group, sulfonium methyl

group, phosphonium methyl group, phosphonate methyl group, monohalogenated methyl group, boric acid group, formyl group, or vinyl group. R^{52} , R^{53} , R^{54} , R^{55} , R^{56} , and R^{57} each independently represent a hydrogen atom, halogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, aryl alkylthio group, acyl group, acyloxy group, amide group, imide group, Imine residue, amino group, substituted amino group, substituted silyl group, substituted silyloxy group, substituted silylthio group, substituted silylamino group, monovalent heterocyclic group, arylalkenyl group, aryl ethynyl group, carboxyl group, or cyano group. R^{53} , and R^{54} , R^{55} and R^{56} may be connected mutually to form a ring. R^{58} represents an alkyl group, aryl group, arylalkyl group, or a monovalent heterocyclic group.)



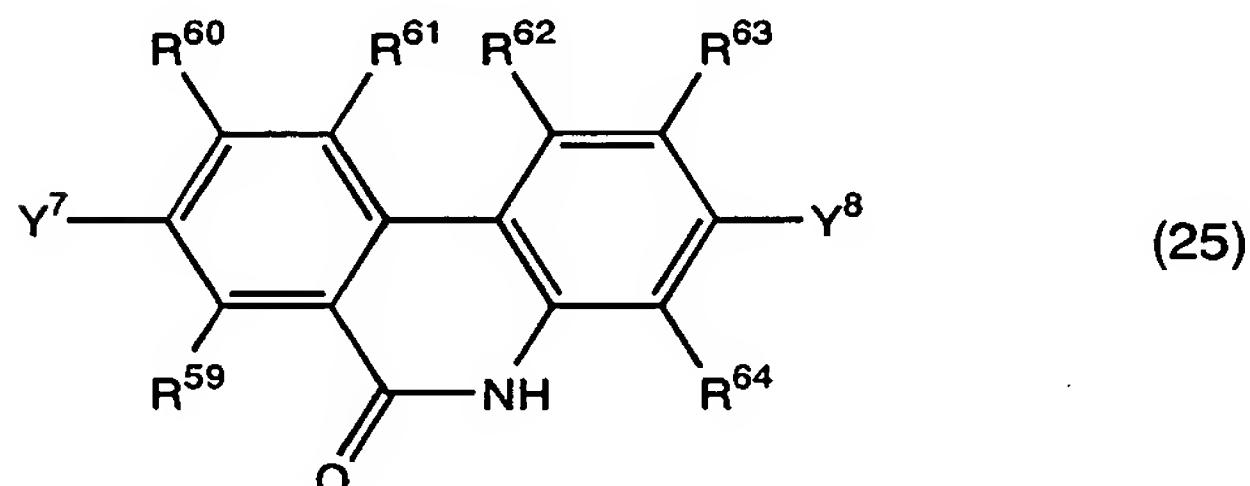
(in the formula, R^{52} , R^{53} , R^{54} , R^{55} , R^{56} , R^{57} , R^{58} , X^{14} , and Y^6 represent the same meaning as the above. Z^5 represents a hydrogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, aryl alkylthio group, substituted amino group, substituted silyl group, monovalent heterocyclic group, arylalkenyl group, or aryl ethynyl group.)



(in the formula, R^{52} , R^{53} , R^{54} , R^{55} , R^{56} , R^{57} , R^{58} , X^{14} , and Y^5 represent the same meaning as the above. Z^6 represents a

hydrogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, aryl alkylthio group, substituted amino group, substituted silyl group, monovalent heterocyclic group, arylalkenyl group, or aryl ethynyl group.).

21. A compound represented by the below formula (25),



(in the formula, Y⁷ and Y⁸ each independently represent a halogen atom, alkylsulfonate group, arylsulfonate group, arylalkylsulfonate group, boric ester group, sulfonium methyl group, phosphonium methyl group, phosphonate methyl group, monohalogenated methyl group, boric acid group, formyl group, or vinyl group. R⁵⁹, R⁶⁰, R⁶¹, R⁶², R⁶³, and R⁶⁴ each independently represent a hydrogen atom, halogen atom, alkyl group, alkyloxy group, alkylthio group, aryl group, aryloxy group, arylthio group, arylalkyl group, arylalkyloxy group, arylalkylthio group, acyl group, acyloxy group, amide group, imide group, imine residue, amino group, substituted amino group, substituted silyl group, substituted silyloxy group, substituted silylthio group, substituted silylamino group, a monovalent heterocyclic group, arylalkenyl group, aryl ethynyl group, carboxyl group, or cyano group. R⁶⁰, and R⁶¹, R⁶² and R⁶³ may be connected mutually to form a ring.).

22. A manufacture method of a compound whose X¹³ is a nitrogen atom in the above formula (23-1) to (23-3), or a compound whose X¹⁴ is a nitrogen atom in the above formula (24-1) to (24-3), wherein the compound represented by the above formula (25) is reacted with a halogenated alkyl, halogenated aryl, halogenated arylalkyl, or halogenated heterocyclic-ring

compound in existence of a base.

23. A composition comprising a polymer compound according to any one of claims 1 to 11, and at least one kind of materials selected from a hole transporting material, an electron transporting material and a light-emitting material.

24. An ink composition comprising a polymer compound according to any one of claims 1 to 11.

25. A light emitting thin film, a conductive thin film, or an organic semiconductor thin film, comprising a polymer compound according to any one of claims 1 to 11.

26. A polymer light-emitting device having an organic layer between electrodes consisting of an anode and a cathode, and the organic layer containing a polymer compound according to any one of claims 1 to 11.

27. A polymer light-emitting device according to claim 26, wherein the organic layer is a light emitting layer.

28. A polymer light-emitting device according to claim 27, wherein a light emitting layer contains further a hole transporting material, an electron transporting material, or a light-emitting material.

29. A flat light source, segment display material, or dot matrix display apparatus, comprising a polymer light-emitting device according to any one of claims 26 to 28, or a liquid crystal display comprising a polymer light-emitting device according to any one of or claims 26 to 28, as a back light.